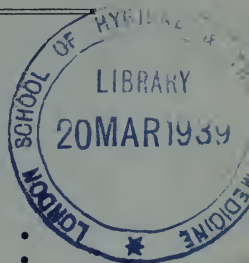


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Manchester Health Lectures for the People.

NEW SERIES, No. 3, 1902.



SMALLPOX :

The Case for Vaccination.

By J. WILSON HAMILL, M.D.

*Issued by Authority of the Manchester and Salford Sanitary
Association, 33, Brazennose Street, Manchester.*

PRICE ONE PENNY.

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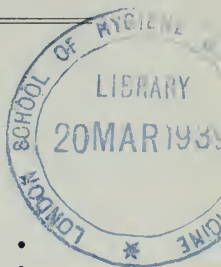
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SMALLPOX :

THE CASE FOR VACCINATION.

BY J. WILSON HAMILL, M.D.

It has been thought desirable by the Committee of the Manchester and Salford Sanitary Association to include among its new publications a short paper on this subject, one which is at all times full of interest and importance and often the cause of sharp controversy and bitter feeling. It is not necessary, therefore, to emphasise its gravity ; for although smallpox is not, and never again will be, the scourge and terror it was in the 18th and preceding centuries, it is very evident from our experience of several recent epidemics that amongst a population susceptible to its influence, it still retains much of its ancient virulence and power. It will be my endeavour to present the case for vaccination as fairly and at the same time as briefly as possible, to point out the main arguments in favour of, and the objections urged against it by its opponents.

There is no need in such a paper as this to give a lengthened history of the disease, but it does seem necessary to remind those who are fortunate to live in the second year of a new century, and to many of whom this disease is only a memory and a name, that at the beginning of the nineteenth century its ravages appeared in all countries and amongst all classes and in all ages. The very young suffered most, as many who grew to middle life and old age were in a certain measure protected by having had an attack in childhood.

Many of the old parish registers of England, and the recorded statistics of this and other countries, testify to its enormous fatality, especially amongst children under 10 years. In Pudsey, in Yorkshire, there is mentioned in the Parish Register the melancholy fact that in the year 1787, from September 15th to October 18th (about one month), out of 26 deaths recorded, 19 were caused by smallpox, all of them under 10, and most of them under 5 years of age. In a second period, between June 16 and

September 29, 1792, out of 33 deaths 15 were caused by smallpox, these also under 10 and most of them under 5 years. Another kind of historical evidence of the prevalence of the disease in the latter part of the 17th and beginning of the 18th century, is afforded by the study of the old newspapers of that period. The description of nearly every man and woman as exhibited in the portraits of the "Hue and Cry" showed them to have been more or less marked by smallpox, or "speckled with pock-holes," as it was called. The prevalence of this disfigurement was curiously shown in some of the documents of that date, probably to save time and vary the monotony of the print, it was sometimes stated that the criminal was *not* pitted by smallpox.

Dr. Guy stated, after years of study of the question, that "it was the most frightful and destructive pestilence that ever visited mankind; that which came nearest to it in effect was probably the plague." One writer thought he was well under the mark when he stated that for every *one* the plague killed, smallpox destroyed a *hundred*. But it was not only among the criminal classes, as in "Hues and Cries," nor even the lower and middle classes, that evidence of its ravages appeared. The disease did not visit us once or twice in a century, but was constantly with us in a more or less epidemic form, in all seasons, amongst all ranks, and in all ages. It was no respecter of persons, the illustrious and royal were scourged as severely, if not more so, than the criminal classes above referred to.

It was estimated that during the 17th and 18th centuries out of every 100 deaths, 25 were caused by smallpox. The figures for London and Glasgow and other large towns give this mortality for the disease:—In the three months ending September 30, 1898, the deaths from all causes registered in London were 21,277. If smallpox were as prevalent now as it was in the 17th and 18th centuries, over 5,000 persons would have died from it during this period. The smaller towns seemed to have suffered in the same proportion, and every one, with few exceptions, was expected to contract it, in the same way that now most people have measles during some period of their life, with this difference, that a larger proportion seem to escape the latter now. This is shown by the statement of a good authority with regard to Chester in 1775. It had a population of 15,000, and only 1,060, or 1 in 14, had not had smallpox. In the town of Ware about the same time out of 2,575 inhabitants only 302, or 1 in 8, had never had smallpox.

Those who escaped death did not escape the consequences of the disease; nearly all bore its marks on their faces to their graves, many lost their sight, and it is estimated that at that time two out of every three blind people were rendered so by

it. All European countries suffered in the same way and to an equal degree, and in many cases far more severely than England, and it is curious to note in this connection that the first bold method to deal and cope with the malady was introduced into England from Turkey about the year 1722 by Lady Mary Wortley Montague, by the practice of what is known as inoculation. Though there is some evidence that in these kingdoms and other countries some kind or degree of inoculation was practised at a much earlier date, the first clearly recorded case in England is that of the daughter of Lady Mary Wortley Montague. This lady had had her son inoculated some time before at Constantinople. This procedure consisted in producing an attack of smallpox by the introduction of the pus, or matter, from a smallpox pustule into a wound in the skin made for the purpose. By this means an artificial attack of the disease was produced, which was, as a rule, milder and very much less fatal than the attacks of the natural disease. If the consequences had ended here, inoculation would have constituted a very efficient security against a fatal attack. It was found in practice that this artificially created disease protected those subjected to it, to a large extent, from a future attack of smallpox. Although created artificially, and, as a rule, comparatively mild in character, the disease was really and essentially smallpox, highly infectious to those who came into contact with the inoculated person. Presumably those who had been inoculated went in and out in their usual way, to their businesses and pleasures, just as those vaccinated do nowadays, and the result was that they spread the disease. Much praised by some and opposed by others, inoculation fell out of favour for a time, but about 1740 it appears to have been revived, and in 1746 an Inoculation and Smallpox Hospital was established in London, and during the latter half of the 18th century the practice became very general. It was very much more common amongst the rich and well-to-do classes than the poor, and if everyone had been inoculated there is no doubt it would have proved a potent instrument in stamping out smallpox. But it had the fatal defect previously referred to: the person inoculated became a *focus* of infection and spread the disease, a charge which its most bitter opponents have never been able to urge against vaccination.

"The general conclusion which may be drawn seems to be that inoculation had a double influence—one favourable and the other unfavourable—as regards smallpox, and owing to the conflict between these influences it produced but little effect upon the prevalence of, and mortality from, smallpox."—Royal Commission Report.

But when we consider the drawbacks and risks connected with inoculation, we cannot help thinking that the *idea* which suggested its adoption as a means of combating smallpox had in it the hope and promise of a simpler and safer way, and when the outlook was of the darkest, and it seemed as if mankind were to be scourged periodically for all future generations, the first glimpse of a great truth was presented to the mind of Edward Jenner, then an apprentice to an obscure country surgeon at Sudbury, in Gloucestershire. In his daily duties he often heard the gossip of the cowherds of the country, and learnt that they had the belief firmly rooted in their minds that if they had contracted the complaint known as cowpox, a disorder of the teats and udders of the cow, they were not likely to take smallpox. It is curious that this belief was also held strongly in several parts of the Continent, especially in Holland. There are good grounds for believing that this disease called cowpox attacking the cow was really smallpox, or a very similar one, as it is within the experience of many medical men that during epidemics of smallpox cattle are apt to be affected with cowpox. Dr. Jenner believed the two to be identical, although cowpox is not nearly so fatal among animals as smallpox is among mankind. He pondered long on this idea, and mentioned it to some of his friends, notably to John Hunter, the famous surgeon of that day, whose apprentice or assistant he afterwards became, but was only laughed at for his pains. Although ridiculed and sneered at by many, after he had established himself as a surgeon in Berkeley, in Gloucestershire, he began a series of earnest and painstaking investigations and experiments. In June, 1798, he first published the results of his observations, nearly 30 years after its first inception.

A thin quarto volume of about 70 pages, entitled "An Inquiry into the Causes and Effects of Variolæ Vaccinæ," which in plain language means an inquiry into cowpox or smallpox of the cow, and the effects when the disease was experimentally applied to human beings. He showed in his book that people who had had cowpox were scarcely ever known to contract smallpox afterwards, although they had had abundant opportunities of doing so in those days. This, as has been stated, was the popular belief among the dairymaids and cowherds of Gloucestershire, but Jenner went further, and demonstrated in his paper that it was not necessary to be inoculated to obtain this security, but that one human being could be inoculated or vaccinated from another, ensuring the same protection as if vaccinated straight from the cow.

Indifferent to opposition, he modestly continued to prosecute

his investigations, "encouraged (as he himself said) in the hope of becoming beneficial to mankind." At first he tested all his cases to see if the protection held good, by inoculating the matter of smallpox into the system of those vaccinated, to see if they contracted the disease. Writing in 1801—that is three years after the first publication of his discovery—he says: "Upwards of 6,000 persons have been inoculated with cowpox (that is vaccinated), and the greater part of them have been inoculated with smallpox and exposed to its infection in every reasonable way that could be thought of without effect."

This is a test which I think few of our present-day unvaccinated anti-vaccinators (if there be such) would care to undergo—first to be inoculated with smallpox poison and afterwards exposed to its infection (as Jenner quaintly puts it) "in every reasonable way that could be thought of." I am afraid they would fail to appreciate the reasonableness of Jenner's test, whatever might be their opinion on its value.

But the experiences of Jenner did not stand alone. During the year after the publication of his pamphlet, Doctors Woodville and Pearson, physicians of the London Smallpox Hospital, began to make experiments with vaccine matter to ascertain if it gave immunity from smallpox. After having applied the same rigid tests, they came to the same conclusion as Jenner. The experiments of these two observers were no doubt somewhat complicated by the fact that somehow or other cases appear to have been inoculated or to have contracted smallpox at the same time as they were vaccinated, and the operation was followed by some pustules.

It should be remarked in passing that this exposure to smallpox infection does not matter after the vaccination has taken effect, and only refers to the first few days after the operation.

It is necessary to go somewhat into detail on this point, as some of those opposed to vaccination have expressed the opinion that all these early vaccinations done by Jenner, and more especially those of Woodville and Pearson, were as a matter of fact inoculations. It may be admitted that a few of Woodville's and Pearson's, those that were followed by rashes, were so, through some accidental contamination with smallpox matter or aerial infection; but when these accidents were avoided by proper care and precautions, the cases were of the true type of cowpox vaccination, and stood the test both of inoculation with smallpox matter and exposure to the infection of the disease.

Reverting for a moment to the early history of vaccination, it is important to note that Jenner, when he first announced his discovery to the world, had a large and powerful opposition ranged

against him, both in the medical profession and the general public. Controversy raged round the question, the practice was ridiculed, all sorts of grotesque changes and new diseases were prophesied for those who submitted to the operation. The medical profession was greatly divided, many of the doctors being against Jenner. This lasted for many years, until 1807, when the Royal College of Physicians was commanded to take evidence and make a report to the House of Commons. The enquiry made by this body was most thorough and exhaustive. No facts were taken as proved without the strictest evidence. The College had the result of several hundred thousand cases placed before them; it had evidence as well which was not entirely favourable to vaccination. As the result of this inquiry, this body, previously divided in its opinions, became practically unanimous, and the conclusion arrived at was, "that although vaccination in some instances failed to protect, it afforded greater security against smallpox than the inoculation previously in use, while the illness induced by it was milder and less hazardous." The opinion of the medical profession in favour of vaccination has been practically unanimous from that day up to the present time. I do not say that there are not a few opposed to it, one sees their names occasionally advertised at anti-vaccination meetings; but I think I am safe in stating that there is not more than one in a thousand of these unbelievers in its efficacy. This in itself, apart from arguments to be stated later on, is a tremendous proof in its favour. Speaking from the very lowest point of view, it is not to their pecuniary interest to stamp out smallpox, and from a practical standpoint the great majority of the public are content to accept their views on this question, as they are the class who in smallpox hospitals and general practice have the most intimate knowledge of the disease and its workings.

But it is sometimes tauntingly stated in anti-vaccination prints that medical opinion is liable to change and has changed on many important subjects, and they ask "May it not do so on this subject, too?" This statement is quite true in some respects and in certain measures. The science and practice of medicine are constantly advancing, new views and new remedies are continually being put forward, and it may be that some time in the distant future a better preventive against smallpox may be discovered, one possibly not so objectionable to our opponents, but until that happy time arrives, we ought to hold fast to the remedy already in our hands, remembering the old proverb that "one in the hand is worth two in the bush." It may safely be affirmed that probably there is no other subject about which there is such agreement in the medical profession as this of vaccination; the great

mass of medical men have a profound belief and trust in its efficacy. Opinions may vary as to the extent of the security conferred, but as to the great fact there is practically no difference of opinion whatever. And this belief is not confined to the United Kingdom; it is held by the medical profession in all European countries, in the United States, in Japan, and in the Republics of South and Central America. From England the doctrine and practice of vaccination has spread all over the civilised world. Voluntary at first, it has now been made compulsory in all these countries. But even in this respect England lagged behind some smaller Continental countries. In Denmark it was made compulsory by the State in 1810, and in Sweden in 1816, and now she is behind the German Empire, where both vaccination in infancy and re-vaccination are in force.

Now, we must ask and try to answer the question, What are the reasons for the belief and faith of the medical profession in the practice of vaccination? It will be necessary for an explanation of these to quote a few facts and figures, although the writer does not wish to burden this paper with many statistics. Ever since Jenner's day vaccination has been practised, at first in a desultory and voluntary way, but in 1853 it was made compulsory by Lord Lyttleton's Vaccination Act. Up to this date it may be said not to have had a fair and reasonable chance, and yet what do we find? In the 18th century it was estimated that out of each million people 2,000 died yearly of smallpox. This mortality during the first half of the present century fell to 305 per million, during which time vaccination was purely voluntary and only very partially carried out. Since the introduction of compulsory vaccination, in 1853, the mortality has fallen to less than 30 per million, about a seventieth of what it was in the 18th century. In Scotland the decline in mortality is still more notable, the death-rate there being only about six per million, and in Ireland it is only three per million. It is well known and admitted that in these two countries vaccination is far more generally and strictly carried out than in England, the people not yet having had the full advantage of the Anti-vaccinationist literature. But the diminution in the death-rate in these three kingdoms falls far short of that in some Continental countries. Space will not permit me to give many figures to prove this statement, but I have before me the statistics of the Imperial Health Office of the German Empire, published last year, and the figures of that Report seem sufficiently convincing. They refer to the year 1897. In Germany both vaccination and re-vaccination are compulsory. In 1897 there were only five deaths from smallpox in a population

of 53,000,000, giving a mortality of one in ten millions. Of these five deaths, only one occurred in a town (Berlin), and all the deaths occurred in Prussia, all the other States of the Empire being without smallpox mortality. This is a gratifying result of the thoroughness and consistency with which the German Government carries out its vaccination laws.

Now, anti-vaccinators admit in their papers and letters the fact of the enormous decline in the incidence and mortality of smallpox since the practice of vaccination was instituted. They cannot do otherwise; but they attribute it to "sanitation." A few words must be said on this subject, because their reasoning on this theory (at first sight plausible and with a grain of truth in it), when fairly and critically examined is shown to be delusive. No one has a word to say against sanitation as a preventive of smallpox; it is a very valuable adjunct. Insanitary conditions, and unhealthy crowded dwellings, increase the mortality and spread the contagion of it and all infectious diseases. Perfect sanitation helps the individual to resist all diseases, and therefore it is to be regarded as an auxiliary force, but small in comparison with vaccination in the attempt to eradicate this malady. Medical men value sanitation, they try to teach it to their patients, and they do not wish to rob it of any of the credit to which it is justly entitled. But, we are justified in asking: "Are the anti-vaccinators right when they attribute the immense fall in the mortality of smallpox, during the present century, to its influence?"

In the first place, if the sanitary conditions of the last half of the 18th century be compared with those of the first half of the 19th, when there was such a remarkable decline in the mortality of smallpox, we do not find that there was such an appreciable improvement in sanitary arrangements as to account for the decline. If improved sanitary conditions were the main and leading cause, we should expect a similar diminished mortality in other diseases propagated by infection, such as measles, scarlet fever, whooping cough, and diphtheria. But this is not the case. Although the death rate of these diseases varied considerably from year to year, none of them showed a decline at all comparable to that shown by smallpox.

Then, again, if we compare the sanitary conditions of England with those of most Continental countries, we must come to the conclusion that we are ahead of them, at least, in this respect. Take the case of the 270 German towns, each with a population of 15,000 and over, and in which only one death occurred from smallpox in 1897, no one who has visited them could say that their sanitation is of the most advanced and perfect type.

But according to the records of the Registrar-General, there

has been a great decline during the present century in the class of diseases loosely described as "fevers," and anti-vaccinators point to this fall, and say it is due to the same cause to which they attribute the diminution of smallpox. But, this statement, again plausible, will not stand examination. It is well known that in comparatively recent years these diseases have been better recognised and distinguished. Formerly typhus and typhoid (enteric) fevers were considered one disease, and so returned in the Registrar-General's statistics. Sanitation has considerably, probably with the assistance of better methods of treatment, reduced their mortality and frequency, but these are diseases produced in the case of typhus, by overcrowding in ill ventilated dwellings, and by the introduction of contagious material into the alimentary canal, in the case of typhoid. But the reduction in the incidence and mortality of what were formerly classified together as "fevers" is more apparent than real, and many cases put down in this class, before the universal use of the stethoscope and thermometer, are now to be found under other headings. Many local inflammatory and tubercular diseases, accompanied by "fever" or rise of temperature, and presenting many of the symptoms and appearances of the continued fevers no doubt appeared under the class of "fevers," but are now under an improved diagnosis relegated to their proper position and classification.

In connection with this question of the influence of sanitation in the case of smallpox, which is not a disease due to a distinct insanitary condition, as typhus and typhoid fever are, it is interesting to compare the positions of two countries between which there is not much to choose as regards their sanitary condition, viz., Prussia and Austria. In the former re-vaccination was made compulsory in 1874. Since that enactment smallpox has been reduced to very insignificant proportions (as shown by the statistics just quoted from the Imperial Health Returns) when compared with any previous period. Prior to 1874, although the numbers varied considerably in both countries—sometimes greater in one, sometimes in the other—no great difference was observed; but after the enactment of compulsory re-vaccination in Prussia, the difference in the mortality is very striking, and is given below:—

Deaths per 100,000 of Population.

Year.	Prussia.	Austria.	Year.	Prussia.	Austria.
1862	21·06	31·14	1872	262·37	189·93
1863	33·80	53·10	1873	35·65	323·36
1864	46·25	84·78	1874	9·52	178·19
1865	43·78	45·53	1875	3·60	57·73
1866	62·	36·85	1876	3·14	39·28
1867	43·17	74·08	1877	0·34	53·18
1868	18·81	33·27	1878	0·71	60·59
1869	19·42	35·18	1879	1·26	50·83
1870	17·52	30·30	1880	2·60	64·31
1871	243·21	39·28	1881	3·62	82·67

—*Royal Commission Report.*

Analysing these figures, we find, say in the years 1877 and 1878, that the mortality in Austria in the former year was 177 times greater than that of Prussia; and in 1878 it is about 86 times greater. This condition obtained three years after compulsory re-vaccination became law in the latter country; but our opponents, on the sanitation theory, would argue that Prussia was 717 times more perfect in her sanitary arrangements than Austria.

These figures show distinctly that the cause for the enormous decline in the mortality of smallpox is not to be found in improved sanitation, but must be looked for elsewhere, and that cause is, without doubt, both in the countries just now referred to, and, indeed, everywhere, *efficient vaccination and re-vaccination*. All the virtue lies, in this case, in the word *efficient*.

It is not easy to deal satisfactorily with the masses of statistics which have been introduced into this controversy, within the limits of a short pamphlet, but it will be necessary to quote a few figures relating to former and recent epidemics of smallpox. All these show clearly to anyone with an open mind the enormous protective power of efficient vaccination, and still more so when that is followed by re-vaccination at the end of childhood. It is possible that this protective influence may, as time advances, become weaker, and at length die out in the individual; and it may be admitted without in any way detracting from Jenner's prescience, that the protection afforded may not be as perfect, prolonged, and absolute as he believed it was. Niemeyer states that "the protection against smallpox afforded by vaccination is for a far shorter period than is generally believed." "No definite result has been arrived at as to the length of the protective power of vaccination, and the practical conclusion is to advise the re-vaccination of every one, but especially of adults up to the age of 20 and 30, at the beginning of any epidemic, no matter what length of time has elapsed since the last vaccination (J. Simon).

As to the protective influence of efficient vaccination and re-vaccination there can be no doubt whatever, if the statistics from all recent epidemics are carefully considered, in addition to the facts which have been quoted from the results observed in all civilised countries. Some of the anti-vaccinators say that figures can be made to prove anything, but, with all respect to their opinions or prejudices, one can only reply that in such cases statistics are the only reliable sources of information, the only basis upon which any general conclusion can be arrived at, especially if they are tabulated from observations and experience in all countries and through a long series of years.

If we consider the results gained in some of the epidemics which have occurred in England, we find from the figures arrived at after investigation, that all tend to prove the comparative immunity, both from a severe attack and from a fatal result when attacked, of those who have been vaccinated in infancy and re-vaccinated afterwards. Take the Sheffield epidemic of 1887-8. There were 825 vaccinated cases in the Borough Hospital during that time. This table refers to the mildness or otherwise of the attack:—

Vaccinated 825.

293 or 35·5	per cent.	were	varoloid	or	very	mild.
413 or 50·		„	„		discrete.	
107 or 13·		„	„		coherent.	
12 or 1·5		„	„		confluent (severe).	

Unvaccinated 237.

None had the mild form.

50 or 17·9	per cent.	discrete.
175 or 62·5	„	coherent.
12 or 19·5	„	confluent (severe.)

Showing among the vaccinated 82·8 per cent. of mild and 17·2 per cent of severe cases. Among the unvaccinated the proportion was exactly reversed, showing 18·5 of mild and 81·5 of severe cases.

When we compare the returns of the comparative mortality in the vaccinated and unvaccinated classes, we find that at Sheffield 4,151 persons of all ages, stated to be vaccinated, were attacked, of whom 200 died, a percentage of 4·8.

552 unvaccinated of all ages were attacked, of whom 274 died, a percentage of 49·6, half of those attacked. At Gloucester in 1895-6,

1,211 stated to be vaccinated were attacked, of whom 120 died, a percentage of 9·9.

768 unvaccinated had attacks, of these 314 died, 40·8 per cent.,

so that we find that in all these epidemics nearly half of all unvaccinated persons who contracted the disease were carried off.

The records of the epidemic at Hull (1899) show much the same proportion. The most recent figures available give 588 cases, of whom 504 were stated to have been vaccinated, among these there was a death rate of 9·5 per cent., 84 unvaccinated persons were attacked, and 50 per cent. of these died.

The present great London epidemic shows similar returns to those already quoted, and it may be considered the first fruits of the new Vaccination Act of 1898, by which *practically* vaccination became non-compulsory.

During the year 1901, 1,017 cases of smallpox were treated at the Hospitals of the Metropolitan Asylums Board, and with regard to these the Committee of the Board report with reference to vaccination, that the cases were divided into three classes.

1. Vaccinated, *i.e.*, cases having visible scars.
2. Doubtful, including (*a*) cases stated to have been vaccinated but bearing no visible evidence thereof, (*b*) cases in which no statement was made but in which the eruption prevented any reliable observation as to cicatrices, and
3. Unvaccinated, *i.e.*, cases admittedly unvaccinated, bearing no marks of the operation, and to which no statement was made.

With regard to age, the Committee points out that under 10 there were only 12 vaccinated cases, and no deaths; six doubtful cases, all of whom died; and 95 unvaccinated cases, of whom 52 died; a mortality of 54·74 per cent.

Under 20 there were 161 vaccinated cases, of whom three died, a percentage of 1·86; 12 doubtful cases, of whom seven died, a percentage of 58·33; and 161 unvaccinated cases, of whom 79 died, a percentage of 59·07. The Committee further points out that there appears to be a distinct diminution in the protective power afforded by primary vaccination after the age of 20 years; the death rate rising from 9·85 per cent. in vaccinated cases between 20-25 years of age to 28·95 in cases between 35 and 40 years.

The results observed in all these epidemics show most strongly the protective power of any kind or degree of vaccination.

But the evidence drawn from the experience of the cases of certain well protected classes and individuals is very important and conclusive.

At the Homerton Smallpox Hospital, Dr. Gayton reports that from 1871 to 1877 366 persons were employed at the Hospital, all were re-vaccinated on commencing duty but one, and she was the only one who contracted the disease.

At the Highgate Smallpox Hospital, 107 nurses and attendants,

none of whom had had smallpox, were re-vaccinated, with the exception of the gardener, and he was the only one who took the disease.

At the Sheffield Hospital, during the epidemic, 80 nurses and attendants were re-vaccinated, none of these contracted the disease; 63 had only been vaccinated in infancy, six of these contracted it and one died.

A special committee of the Epidemiological Society has since investigated this subject, and they have found, out of 655 persons who had been in attendance on smallpox patients, 645 had been re-vaccinated, not one of these contracted the disease; the remaining 10, who had been only vaccinated in infancy, all took it.

Dr. Grimshaw, Registrar-General of Ireland, states that at one time he was connected with the Smallpox Hospital in Dublin, and that all the nurses and servants were re-vaccinated there, and all escaped the disease. There was a resident pupil in the hospital, who refused to be re-vaccinated; he contracted the disease and died of it.

Another illustration of the protection afforded by efficient vaccination and systematic re-vaccination is afforded by the cases of our own as well as foreign armies, navies, police, and postmen. Take the case of the British Army. Since 1858 it has been customary to re-vaccinate every recruit; before that date the average mortality was about 20 per 100,000, but in the 10 years 1859-1868 it fell to 5 per 100,000. In the 10 years 1869-1878, which include the great epidemic of 1871, it fell to 4·7; in the next 10 years, 1879-1888, the mortality fell to 0·8, and from 1888 to 1894 there were no deaths at all. In the army in the colonies there have been no deaths from smallpox since 1881.

In the Navy re-vaccination has been compulsory since 1864 to persons entering the service, and since that time, as in the Army, the death-rate from smallpox has shown a similar decline. In the German Army, where vaccination and re-vaccination are carried out with more stringency than in our own, the results are still more remarkable. During the great epidemic which followed the Franco-German war of 1870-71, a comparison of the two armies as regards this epidemic will prove instructive. In the imperfectly vaccinated French Army of about 750,000, the Government estimated that about 6,000 succumbed to the disease, while in the German Army, estimated at over a million, the deaths were only 278. Since 1885 there have been no deaths at all from it in the latter army.

In the Bavarian Army re-vaccination was made compulsory in 1843, and from that year until 1857 not a single unmodified case of smallpox occurred, nor a single death. In Bavaria generally,

vaccination and re-vaccination are both now compulsory, and smallpox is so nearly stamped out that there was only one case in the whole kingdom in 1897.

If it were necessary to add to this mass of information and evidence as to the immunity of the well protected classes, much more might be added to the same effect.

It will be convenient at this point to say a word on the quality—*i.e.*, the efficiency—of vaccination when tested in an epidemic of smallpox. In the foregoing figures and tables it has been assumed, under the term “vaccinated,” that all who have undergone the operation are equally well protected; but this is not so. If this were the case, there is no doubt that these figures would give even better evidence of the protective value of vaccination. It has been always known that the larger the number and area of the marks or *cicatrices*, the greater was the immunity enjoyed by the individual, and this was very clearly proved by evidence given before the Royal Commission. The Commissioners say in their report, “the greater the number of marks, the greater is the protection enjoyed by a vaccinated person.”

Dr. Gayton, in his analysis of cases treated by him at the Homerton Fever Hospital, reports on 2,085 persons:—

	Died.	Per cent.
529 with 1 good mark	22	4·1
649 „ 2 good marks	22	3·3
518 „ 3 „	12	2·3
389 „ 4 or more	6	1·5

Mr. Marson also gives the result of his experience at the London Smallpox Hospital for a long term of years, in the *Transactions* of the Medico-Chirurgical Society, and, taking the figures from 1852 to 1867, we find that the mortality among those

	Per cent.
(1) Stated to have been vaccinated, but with no mark	39·4
(2) With 1 mark	13·8
(3) With 2 marks	7·7
(4) With 3 marks	3·0
(5) With 4 or more	0·9
Unvaccinated	34·9

It is probable that many included in Class I. ought to be placed among the unvaccinated, and these figures do not include the evidence of the further immense protection afforded by efficient re-vaccination at the end of childhood or in after life, which was referred to in the tables relating to the *especially protected* classes,

but they show indisputably that when vaccination is thorough, apart from any re-vaccination, the immunity appears to be the greatest.

But anti-vaccinators allege not only that vaccination has no effect in diminishing the risk from smallpox, but also that it is hurtful, and has been the cause of the increase of certain other diseases; and, indeed, according to some of them, it is spoken of as the cause of nearly all the ills that flesh is heir to. This certainly is a very serious charge against vaccination, and deserves very careful examination. Medical men hear this sort of charge continually from parents, a charge made without, in the immense majority of cases, a particle of likelihood or proof. It would, indeed, seem to one sometimes, that children never had any ailments prior to Jenner's time.

It is somewhat unfortunate that, vaccination being performed so early, every ailment a child may be subject to must almost necessarily, in point of time, come after the operation, and the natural consequence of this is that nearly everything which does come is attributed to the child's vaccination. Of course the Anti-vaccination Society, in its methods of working, would not foster this sort of thing; but one is safe in saying that the relation of cause to effect, abstruse points in pathology, present no difficulty to the anti-vaccinationist. He has his favourite theory ready for each one of these as it arises. He can explain everything by this--all the ailments of childhood, any apparent or real increase in the death-rate, and, I believe, even the apparent increase of cancer has been attributed to this cause.

We have no desire to escape these charges however far-fetched and extravagant they may seem at times, but it would not be profitable to follow all the tortuous windings of the arguments or statements that have been made by our opponents with reference to the evils they have attributed to vaccination. Their attacks have mainly assumed two forms, in the first they have selected certain groups of diseases, in which they say the mortality has increased, but they do not always take the same diseases in their comparisons, and they ignore the fact that infant mortality has decreased since vaccination was adopted.

As a matter of fact, it has diminished as the evidence given before the Royal Commission showed. The Registrar-General's returns show that from 1838 to 1842 the annual infantile death rate per 1,000 births was 152, from 1847 to 1850 it was 154, from 1851 to 1860 it was 154, 1861 to 1870, 154, and from 1871 to 1880 it fell to 149, in 1881 to 1890 it was 142.

Consumption and other tubercular diseases have also been attributed to vaccination, but it is only necessary to say that

mortality from consumption has fallen immensely since the beginning of the present century.

It has been alleged with great persistency by anti-vaccinators that syphilis has been increased and caused by vaccination ; if this charge were substantiated, it would be a very strong argument against the operation. The writer personally has never seen a case, in practice, of this disease so produced, nor has he heard of one, amongst many medical friends, so that one's knowledge on this point must be drawn from evidence produced in other quarters.

Speaking personally, one can only say that the appearances and symptoms of a child suffering from this disease are so characteristic directly from its birth, that it is almost inconceivable that any medical man would vaccinate such an infant, and still more so (if the comparison were not ridiculous), that having vaccinated it, he should take lymph from it for any other child. But the evidence given before the Royal Commission has an important bearing on this point generally.

" It is a fact (the Report says) that deaths attributed to syphilis have increased amongst infants under one year. The records of the mortality show that it is most largely fatal during the first three months of life. Such statistics as we have on the point indicate that the increase has been greatest in that portion of the first year which would be practically unaffected by vaccination. There is certainly not the slightest sign of a cause operating in the latter portion of that age period to increase the mortality from syphilis which is absent in the first three months of it."—
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A very important argument on this point, which appears to me conclusive, may be drawn from the case of Ireland, where vaccination is much more strictly and generally carried out than in England, yet the infantile death rate there has steadily declined, from 124 in the years 1864 and 1865 down to 40 in recent times. These figures do not suggest that efficient vaccination has been the cause of an increase of this disease, but rather the contrary. Contrasting Ireland, where vaccination is well performed and where the death rate has fallen to less than a third of what it formerly was, with a place which has now probably the palm of being the worst vaccinated town in England, viz. Leicester (the Vaccination Act there have practically fallen into abeyance), therefore if the anti-vaccinationists' charge be true, we ought to find a great decrease in infantile syphilis. But what do we find? The Registrar-General placed some very important figures before the Commission, as regards the prevalence of this disease, in that town as compared with England and Wales. The Commission report that—

"The Registrar-General has supplied us with the means of comparing the deaths in the period 1863-1867 with those in the period 1883-1887. We have already seen that the latter years were marked by a great decrease in the practice of vaccination, amounting at last to a practical disuse of it."

If vaccination were to any serious extent a cause of syphilis we should have expected to see some evidence of it in the comparative records of the mortality of infants under one year. Yet we find that whereas in England and Wales there was between the former and the latter period an increase in the mortality of infants from the disease, an increase of 24·7 per cent. only, the increase in Leicester between the same periods no less than 69·3 per cent. This, of course does not imply any connection between the disuse of vaccination and the increase of this disease, but it does, however, conclusively rebut the argument of those who seek to connect the increase of the mortality of this disease and the practice of vaccination.

Dr. Seaton, the late Medical Officer of Health for Nottingham, who has studied this subject very carefully, says: "The danger, if indeed there be any at all, of giving through vaccine lymph, in an ordinary well-done vaccination, any other infection than its own, must be so small that for all practical purposes we must regard it as not existing at all."

This remark will also apply to erysipelas. Our opponents say that vaccination is a prolific cause of this affection. This is a complication which may follow vaccination, or indeed any wound or scratch of the skin; but is not the protection conferred worth the infinitesimal risk incurred? If a man travel to London by train instead of walking the distance, he runs a certain amount of risk of accident in the train, but does he stop to calculate the amount?

But again, on this question, too, facts and figures are against the anti-vaccinators. The last Parliamentary returns, obtained with a view of ascertaining the relation of vaccination to these diseases, do not indicate any increase in the infant mortality from erysipelas; but, on the contrary, there is a declining mortality.

If it be worth while to compare Leicester with the rest of England and Wales, on this point, we find during the years 1883 to 1887 there was a decrease in the infant mortality from erysipelas in England and Wales of 16·7 per cent. as compared with the years 1863 to 1867, while in Leicester there was instead an increase of 41·3 per cent. We have, therefore, more logical grounds for retorting that the want of vaccination was the cause of the increase of erysipelas in Leicester.

The main result (the Royal Commission reports) of all the

enquiry into all the alleged cases of injury, is that the dangers of vaccination are relatively "insignificant" in proportion to the vast amount of vaccination done, and there is reason to believe that these dangers are diminishing under the better precautions of the present day, and with the addition of further precautions which experience suggests will do so still more in the future. One of these is a larger adoption of animal vaccine or calf lymph; this will afford absolute security against the possible risks dreaded by many parents.

Space will not permit any lengthened reference to the Vaccination Act of 1898 and its probable consequences if continued after its five years term. By it the operation has become practically voluntary again; but in spite of this fact it is pleasing to learn, from the returns of the Registrar-General, that the amount of vaccination has not fallen off in the country, and that the intelligence and good sense of the great bulk of the people have convinced them of the protection afforded to their health and lives by the operation.





